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ABSTRACT

Little research on literacy learning in persons with developmental disabilities has been done. The little that does exist makes clear that some individuals with autism can, and do, learn to read. Adults and adolescents with cognitive impairments have received greater research attention than have others with developmental disabilities. Subjects with a wide range of cognitive skills have demonstrated the ability to learn single words in a variety of contexts under a variety of conditions. The few studies that have investigated areas such as reading comprehension and generative writing appear to indicate that individuals with significant cognitive impairments can, and do, demonstrate higher level literacy competencies when provided with appropriate instruction, experiences, and opportunities. Studies of literacy in adults with cerebral palsy (CP) have examined word and subword performance as well as sentence-level and text-level performance. Instructional strategies have been designed and studied experimentally. Several studies have profiled the literacy performance of individuals with CP on a variety of tasks. A future research agenda might include the following: literacy learning and instruction in adults with developmental disabilities; research designs; literacy assessments validated for use with adults who have developmental disabilities; best practices in literacy; and contexts that support literacy learning for adults with developmental disabilities. (Contains 124 references.) (YLB)

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NATIONAL CENTER ON ADULT LITERACY

LITERACY AND ADULTS WITH DEVELOPMENTAL DISABILITIES

Karen A. Erickson
David A. Koppenhaver
David E. Yoder
The Center for Literacy and Disability Studies
The University of North Carolina at Chapel Hill

NCAL TECHNICAL REPORT TR94–15
NOVEMBER 1994

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NATIONAL CENTER ON ADULT LITERACY
UNIVERSITY OF PENNSYLVANIA
3910 CHESTNUT STREET
PHILADELPHIA, PA 19104-3111
PHONE (215) 898-2100 FAX (215) 898-9804

The National Center on Adult Literacy (NCAL) was established in 1990 by the U.S. Department of Education, with co-funding from the Departments of Labor and Health and Human Services. The mission of NCAL addresses three primary challenges: (a) to enhance the knowledge base about adult literacy; (b) to improve the quality of research and development in the field; and (c) to ensure a strong, two-way relationship between research and practice. Through applied research and development and dissemination of the results to researchers, policymakers, and practitioners, NCAL seeks to improve the quality of adult literacy programs and services on a nationwide basis. NCAL serves as a major operating unit of the Literacy Research Center at the University of Pennsylvania.

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LITERACY AND ADULTS WITH DEVELOPMENTAL DISABILITIES

Karen A. Erickson
David A. Koppenhaver
David E. Yoder
The Center for Literacy and Disability Studies
The University of North Carolina at Chapel Hill

Abstract

In this paper, research is reviewed on literacy as it pertains to adults and adolescents with three representative types of developmental disabilities: autism, mental retardation, and cerebral palsy. The literature review and synthesis are grounded in the belief that literacy is even more important to persons with severe disabilities than to nondisabled persons. Literacy is central to current debates and to reform efforts aimed at increasing inclusion, developing independence, and broadening employment options for persons with disabilities. Research reviewed here pertaining to individuals with autism or mental retardation was found to consist largely of single-word studies of word use, recognition, and spelling. Research in literacy and individuals with cerebral palsy historically looked within the individual for explanations of learning difficulties, but more recently has examined learning contexts and instruction strategies. The paper concludes with implications and suggestions for a future research agenda.

INTRODUCTION

The study of literacy learning and instruction in children has a long and rich research history. In fact, roughly a thousand or more research reports on reading alone have been published annually since 1980 (Dykstra, 1984). The study of literacy and adults, while neither as long nor as rich, is nonetheless substantial. These histories, however, are exclusive in nature, involving almost solely those children and adults who are nondisabled. Investigations into literacy learning in persons with disabilities, particularly developmental or severe disabilities, have a remarkably short history—remarkable in that the difficulties in teaching or assessing such individuals are substantial, widely known, well documented, and, most important, poorly understood.

In the past decade, however, a growing interest has been demonstrated in studying literacy learning, instruction, assessment, and use as they pertain to individuals with disabilities. Because of the diversity of the populations involved, these studies are to be found in a wide range of journals devoted to language disorders, health care, special education, speech and language development, occupational or physical therapy, medicine, and psychology, among others. In fact, the research can be found virtually everywhere except in publications devoted to literacy. We know of only one published work pertaining to literacy and adults with developmental disabilities, a case study by Gipe, Duffy, and Richards (1993) of a literacy tutoring program for an adult with cerebral palsy, which appeared in the literacy periodical, the *Journal of Reading*.

This report was conceived with three objectives in mind: (a) to provide a synthesis of the findings in literacy studies pertaining to three subgroups of the population of individuals with developmental disabilities (i.e., adults with autism, mental retardation, or cerebral palsy); (b) to make adult literacy service providers, researchers, and policymakers aware of a population heretofore largely ignored; and (c) to suggest some directions for initial research efforts in this area.

Readers will not be overwhelmed by the quantity of research reviewed. That is the state of the art. While we do not claim that the following review is comprehensive in nature, our search was extensive. There are additional studies to be located with additional digging, but few will be found in peer-reviewed journals. Nor do we expect readers with a background in adult literacy to be overwhelmed by the elegance of the research designs, the profundity of the questions investigated, or the literacy insights revealed. That, too, is the state of the art. The number of researchers who have developed a line of study within literacy and developmental disabilities worldwide can be counted on your own fingers and toes, with some digits to spare. Until more researchers from more disciplines take a greater interest in the pressing problems faced by individuals with developmental disabilities as they attempt to learn to read or write, breakthroughs in understanding and methods are likely to be few and far between.

IMPORTANCE OF LITERACY TO PERSONS WITH DEVELOPMENTAL DISABILITIES

Literacy is a concern throughout our nation. The recent publication of *Adult Literacy in America* (Kirsch, Jungeblut, Jenkins, & Kolstad, 1993) revealed some alarming statistics concerning adults with inadequate literacy skills across our nation. As employers have indicated for years, many adults are entering the workforce without the skills they need in order to function adequately. The survey indicates that 94 million Americans do not have the literacy skills necessary to perform moderately demanding jobs. A related concern is that 71% of these individuals indicated that they believed they read well or very well. Widespread improvements in adult literacy may be difficult to achieve without greater recognition of the need for help among poor readers and writers.

Clearly there is an understanding that a problem exists at some level. In the Bush era, *America 2000* (U.S. Department of Education, 1991) established national education goals, which included adult literacy. These goals, which are being pursued by the current administration, specifically state that "every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship" (U.S. Congress, 1994, p. 9). Attainment of this goal would lead to a dramatic shift in the numbers reported in *Adult Literacy in America.* Unfortunately, it is difficult to clearly define literacy on a year to year or even a day to day basis. In addition, it is difficult to serve a population that does not recognize that it is in need of services and does not seek out those services when they do. As many as 90% of adults with low literacy skills never receive literacy services, and a majority of the 10% who do seek services do not remain long once they have enrolled (Kirsch et al., 1993).

This brief discussion of the nation's literacy status in terms of the general population serves as a base from which to consider the needs of the population of adults with developmental disabilities. The difficulties in acquiring literacy skills for these adults are plentiful. Furthermore, they are often overlooked in the quest to resolve the nation's overall literacy problems. The use of the descriptor "every" in the *America 2000* goals is a step in the right direction. It recognizes that resolution of literacy difficulties is a nation-wide effort with implications for every adult American. The single descriptor acknowledges the fact that literacy is important for all individuals, including those with disabilities.

It is arguable that literacy skills are more important for adults with developmental disabilities than they are for adults without disabilities. Literacy has the potential to have a significant impact across life domains for individuals with disabilities. Literate individuals with disabilities have a wider range of vocational options as adults (Richardson, Koller, & Katz, 1988). Literate adults with disabilities, particularly those who are nonspeaking, are better equipped for face-to-face interactions (Koppenhaver,

Coleman, Kalman, & Yoder, 1991). Literate individuals with disabilities are more readily accepted by their peers (Donahue & Prescott, 1988). Finally, competence in literacy brings with it higher expectations and increased opportunities for individuals with disabilities.

The impact of literacy is felt from infancy for all individuals. Emergent literacy research suggests that literacy and language skills develop concomitantly from birth (Teale & Sulzby, 1986). If children with disabilities are not given the opportunities they need in order to develop literacy and language from birth, how can the time be made up when they become adults? Research indicates that for parents of children with disabilities, literacy is displaced as a high priority by more basic concerns for the child's health, physical development, and self-care (Light & Kelford Smith, 1993). Instead of having frequent opportunities to interact with print, they have limited opportunities. Instead of being (inter)active participants in print-based activities, children with disabilities are passively involved, occasionally pointing or nodding when directed. From a very early age, individuals with and without disabilities have very different literacy experiences.

When children with disabilities enter school programs, these limited experiences typically manifest themselves as difficulties in learning to read and write. These difficulties most often lead to placement in special classes, where students are required to master a series of skills before they have the opportunity to read and write in order to communicate meaning to others (Koppenhaver et al., 1991). Even the instruction that does not appear to be readiness-oriented allows only limited active participation and most often addresses word study in the absence of text (Koppenhaver, 1991).

A movement toward full-inclusion in regular education classes is leading to a change in mastery approaches to reading instruction for students with disabilities. Full-inclusion gives students with disabilities the opportunity to join regular education classes on a full-time basis. They become a part of a community of readers and writers where they are less likely to be isolated from text-based or functional reading and writing activities. They are taught by teachers who typically have greater training backgrounds and experience in reading and writing methods. They are privy to classroom activities that teach new concepts while reinforcing skills in the context of a purposeful application. They progress through a curriculum that is sequential and logical. The current interest in literacy and individuals with developmental disabilities is due, at least in part, to full-inclusion.

Full-inclusion extends beyond the school. Adults with disabilities are finding themselves increasingly in the position to make choices across all life domains. The Americans with Disabilities Act (1990), in essence a civil rights act, has mandated changes. No longer are adults with disabilities housed solely in large residential facilities; increasingly they are living in neighborhoods, communities, and in group homes. No longer are all of their needs met under one roof and community services are increasingly accessible. No longer can they depend on having a familiar listener with them at all times to make their needs known to strangers; they are communicating face-to-face with unfamiliar listeners.

Inclusion in the community is increasingly leading to inclusion in the workplace. The need for literacy skills in the workplace is contributing to the

current interest in literacy and individuals with disabilities. When adults with disabilities have literacy skills, they have an increased likelihood for successful employment (Richardson et al., 1988). Because most people learn to read and write in school, it should not be surprising that the number of years in school is positively correlated with employment rate for individuals with disabilities. Persons with disabilities who finish high school are employed at a rate twice as high (43%) as those who do not finish high school (22%) (International Center for the Disabled, 1986). However, literacy is obviously no panacea given the unemployment of many individuals with disabilities who complete even advanced degrees. At the recently convened Pittsburgh Employment Conference, issues that appear to effect the employability of individuals with disabilities (specifically those individuals who are nonspeaking and use augmentative communication devices) were discussed. A consensus was reached that literacy is necessary to, but not sufficient for, employability (Erickson, Koppenhaver, Pierce, & Steelman, 1993); however, issues such as an astonishingly high unemployment rate and negative attitudes of employers and co-workers could not be ignored (e.g., Blackstone, 1993; Light, Stoltz, & McNaughton, 1993). The adults who were the focus of this conference require the same literacy skills that were identified as important for nondisabled adults in *Adult Literacy in America*, but the challenges they face in seeking employment and meeting the goals of *America 2000* appear to be substantially greater.

CURRENT INFLUENCES ON LITERACY AND DEVELOPMENTAL DISABILITIES

In order to understand the myriad influences on literacy and individuals with developmental disabilities, it is important to have a clear understanding of the characteristics of the population. A formal definition of developmental disabilities is offered in the Developmental Disabilities Assistance and Bill of Rights Act of 1990 (P.L. 101-496). It defines a *developmental disability* as a severe, chronic disability of a person that

- is attributable to a mental or physical impairment or combination of mental and physical impairments;
- is manifested before the person attains age 22 years;
- is likely to continue indefinitely;
- results in substantial functional limitations in three or more of the following areas of major life activity: self-care, receptive and expressive language, learning, mobility, self-direction, capacity for independent living, and economic self-sufficiency; and

- reflects the person's need for a combination and sequence of special interdisciplinary or generic care, treatment, or other services which are of lifelong or extended duration and are individually planned and coordinated.

Others have offered less formal definitions. Most often developmental disability is defined as a delay in one or more of the following: cognitive development, physical development (which includes fine and gross motor), communication development, social/emotional development, or adaptive development (Harbin, Danaher, Bailer, & Eller, 1991). Individuals with developmental disabilities require specific early intervention services and often experience continued need of services through much or all of their schooling and adult life. Nonetheless, developmental disabilities are not immutable.

Sameroff (1982) offers a transactional model of development that focuses on the continual interplay between a changing organism and a changing environment. Sameroff (1982) explains, "Development is an organized system. Its complexity is also its virtue. The many paths to happiness in life offer us as many opportunities for education and remediation" (p. 151). In short, while individuals with developmental disabilities are faced by, and present, significant challenges, they also can make substantial gains when provided appropriate learning materials and experiences.

Together with federal legislation, technological advances, and an increased knowledge base, this transactional view of development has influenced current views of literacy and developmental disabilities. First, the legislation has mandated a change in views. There are three main pieces of legislation that have been influential: (a) Americans with Disabilities Act (P.L. 101-336), (b) Individuals with Disabilities Education Act (amended version of P.L. 94-142), and (c) Rehabilitation Act—Section 504 (P.L. 93-112). The Americans with Disabilities Act (ADA) has been characterized as the pinnacle of a civil rights battle fought by individuals with disabilities with particular intensity during the past quarter of a century. The act assures the civil rights of all individuals with disabilities. It provides for equal opportunities in employment, public accommodations, transportation, state and local government services, and telecommunications. It is the culmination of all of the legislation that has emerged to protect the rights of individuals with disabilities.

Section 504 of the Rehabilitation Act is one of the many pieces of legislation that led to the writing and signing of the Americans with Disabilities Act. The Rehabilitation Act protects all individuals with disabilities from discrimination in any federally assisted program or activity. It is intended to compel integration of individuals with disabilities into communities, workplaces, schools, and other environments. In the case of special education, section 504 is often called upon when trying to establish integrated instructional settings for children with disabilities.

The Individuals with Disabilities Education Act (IDEA) was written to deal exclusively with the education rights of individuals with disabilities through age 21. IDEA is intended to provide a "fair and appropriate" education for all students. It specifies that each student identified as having a disability must have an Individual Education Plan (IEP). The IEP is intended to make sure that students are learning the skills they will need to be successful on an individual basis. IDEA also mandates that adolescents with disabilities have a transitional plan aimed at readying them for entry into the workforce and adulthood in

general. Ideally, the IEP and the transition plan provide educational and related services that ready children and adolescents for adulthood by preparing for independence, employment, and self-direction.

The main impact of all the legislation is that it has forced action. Professionals and others who come into contact with individuals with developmental disabilities must provide services. It has been 10 years since Sameroff (1982a) first wrote about the transactional development model. Ten years have passed since the sociocultural nature of development has been recognized, and since the influence of education, services, and opportunities has been understood. Now the legislation is mandating action.

Other knowledge-base changes have influenced literacy and developmental disabilities. In particular, the research in the field of emergent literacy has opened doors. With the understanding that learning to read and write are lifelong learning processes, it follows that no one is so impaired (cognitively, physically, sensorily, or otherwise) that they should be excluded a priori from written language experiences and learning opportunities (Koppenhaver et al., 1991). The concept of emergent literacy stands in direct contrast to previous definitions of literacy as a cognitive process that is learned sequentially as a result of direct instruction in school settings. This is a view that all too often in the past resulted in the exclusion of individuals with developmental disabilities from print-based experiences because they had not mastered their ABCs or memorized their colors, could not speak clearly or lacked fine motor control.

The last two decades have brought about substantial changes in views about literacy. Literacy is now perceived as a social, psychological, and linguistic process (e.g., Bloom & Green, 1984). Emergent literacy research has investigated what children learn about print prior to formal instruction in school settings. It has revealed that written and oral language develop concurrently and interrelatedly from birth (Teale & Sulzby, 1986). Like oral language learning, written language appears to be learned best when it is used in purposeful contexts and when children have opportunities to observe and interact with literate individuals in these purposeful contexts (Auerbach, 1989).

This knowledge base helps us to understand what effective instruction for individuals with developmental disabilities should begin to look like. No longer does it seem appropriate to place children, or adults, who have developmental disabilities in readiness-based programs that require mastery of individual skills prior to text-based reading and writing. Increasingly, pilot programs are demonstrating that, instead, these individuals need to be provided increased and supported opportunities to interact with print and other literate people. They can be provided access to books and other forms of text. They can be provided access to writing tools and experiences. The focus remains firmly on purposeful use of literacy materials and tools. And when such programs are implemented in a variety of settings with a variety of individuals, children and adults with developmental disabilities demonstrate the capacity to improve their understanding and use of print in educational settings and beyond (see, e.g., Cousin, Weekley, & Gerard, 1993; Erickson & Koppenhaver, in press; Gipe et al., 1993; Katims & Pierce, 1993).

A final influence on literacy and developmental disabilities is technology. An exponentially expanding array of computers and other devices are now available that provide access and opportunity while changing our notions about literacy. The Office of Technology Assessment (1993) has identified five broad advantages of technology for adult learners in general. These are

- extending learning beyond the classroom,
- using learning time more efficiently,
- sustaining motivation,
- individualizing instruction, and
- providing access to information tools.

These advantages take on special relevance for adults with disabilities, who often experience difficulties arranging transportation, need to work at an individual pace that provides adequate response time, or need systems that pay conscious attention to finding ways for them to be active and interactive learners.

Several fields have emerged as a result of the technology boom. There are rehabilitation engineers who work to adapt environments and equipment in order to provide access and independence for individuals with developmental disabilities. There are computer and software companies that devote a large portion of their energies toward the development of hardware and software that is particularly appropriate for individuals with developmental disabilities. There are professional organizations such as the International Society for Augmentative and Alternative Communication (ISAAC) that bring together professionals, parents, individuals who use the technology, and others interested in disability issues.

All of these components have merged to effect change in the last decade. Emergent literacy research has provided the knowledge base needed to understand the development of literacy skills. Legislation has mandated the provision of services. Technology has been developed that enables implementation of legislative mandates and literacy learning possibilities.

POPULATION-SPECIFIC ISSUES RELATED TO LITERACY LEARNING

Research regarding literacy and individuals with developmental disabilities is just beginning to reflect changes in views about readiness, skills-based, word-level instruction. A review of the research in this area over the last quarter of a century revealed very few studies that dealt with issues related to the concurrent development of oral and written language. Few studies dealing with literacy in terms of text- and sentence-level reading or writing were found. The following sections synthesize research related to three specific populations with these developmental disabilities: (a) autism, (b) cognitive impairments, and (c) severe speech and physical impairments.

The research was gathered through several methods. Initially, a search of the ERIC, PSYCHLIT, and Dissertation Abstracts was performed. Search terms included, but were not limited to developmental disabilities, mental retardation, cognitive impairments, physical impairments, cerebral palsy, autism, pervasive developmental disorder, literacy, reading, writing, technology, and computers. Each database was searched back to the early 1980s. The articles obtained from references found by the computer search were then used to locate earlier sources, which in turn yielded further studies. This approach was taken because an earlier literature review of literacy learning in nonspeaking individuals found that 77% of the published studies had been conducted since 1982 (Koppenhaver, Coleman, Steelman, & Yoder, 1992). There is, quite simply, little historical precedent to studying reading and writing in individuals with developmental disabilities.

Each of the three specific populations will be defined and discussed individually with respect to the available research and current knowledge base. We will address similarities and differences between the populations and available research before concluding with implications for future research.

Adults and Adolescents With Autism

Autism first appeared in the literature in 1943 as the topic of an article entitled "Autistic Disturbances of Affective Contact" by Leo Kanner. In the article, Kanner, a psychiatrist, presented the case studies of eleven children who had been his patients. The children all presented a common cluster of characteristics that have become the defining characteristics of autism. Although some aspects of Kanner's original definition are now more clearly understood, the basics hold true today (Rutter, 1985). For example, research has demonstrated that the early belief that cold or deviant child-rearing practices on the part of upper-middle class mothers caused autism have no support in fact (Schopler, 1983). Kanner's belief that children with autism were all of normal or supranormal intelligence has also been discredited (Schopler & Mesibov, 1985). However, his belief that autism is characterized by disordered communication continues to be a commonly held belief.

The diagnosis of autism is based on the presence of certain behaviors and characteristics. In particular, a diagnosis of autism is given when an individual, prior to the age of three, presents a serious impairment of the development of social relationships coupled with delayed and deviant language development and stereotyped, repetitive, or ritualistic behaviors (Kanner, 1943; Folstein & Rutter, 1977; Rapin, 1991). No single cognitive profile of autism exists. The National Society of Autistic Children, as referenced in Knoblock (1982), reported that 60% of individuals with autism had IQ scores below 50, another 20% had IQ scores between 50 and 70, and a final 20% had IQ scores above 70.

Although autism involves disorders of the social, cognitive, behavioral, and language domains (Biklen, Morten, Gold, Berrigan, & Swaminathan, 1992), the impairments of communication and language have been central to a majority of research over the past several decades. The research interest has been based on the belief that impairments of communication and language may be linked to cognitive functioning (La Vigna, 1977) and prognosis

(Bartak & Rutter, 1976). In addition, the aberrant behavior frequently found in individuals with autism could be caused by an inability to communicate effectively (Prizant & Schuler, 1987). These aberrant behaviors are believed to begin as "preintentional" behaviors that are shaped into deliberate aberrant behaviors by the reactions of others (Prizant & Schuler, 1987). It is posited that improved language and communication skills can help alleviate this potentially maladaptive shaping (La Vigna, 1977; Prizant & Schuler, 1987).

The language profiles of individuals with autism are diverse. Echolalia, the repetition of others' speech either immediately or at some later time, is evident in 75% of verbal individuals with autism. This high prevalence makes echolalia the speech and language characteristic that arguably receives the most research and intervention attention (Prizant, 1983a). Although traditionally viewed as meaningless, echolalia has been shown to serve both interactive and noninteractive communicative functions believed to be a part of communicative social and cognitive development (Prizant, 1983b; Prizant & Duchan, 1981). Another common characteristic of the language profiles of individuals with autism is gestalt language forms and styles. Gestalt is used here to describe the way in which individuals with autism appear to learn, remember, and reproduce language as whole units. They do not appear to analyze single units and apparently are not cognizant of the internal semantic-syntactic structure of the language unit (Prizant, 1983b).

There is a paucity of literature concerning literacy and individuals with autism. There is, however, a growing body of information on facilitated communication and autism that includes limited discussions of literacy. Hyperlexia, a precocious ability to read coupled with poor comprehension and deficits in linguistic or cognitive functioning (Silberberg & Silberberg, 1967) is frequently associated with autism; however, the relatively large body of research dealing with hyperlexia includes few references to autism. The literature search for this paper produced only two articles addressing more conventional literacy questions for adults with autism. The following discussion, therefore, is organized in three sections: (a) studies involving single-word and text-level questions for the general population of adults and adolescents with autism, (b) hyperlexia and adults with autism, and (c) facilitated communication and its literacy implications.

SINGLE-WORD AND TEXT-LEVEL STUDIES

There is a dearth of research regarding literacy and individuals with autism who do not display the precocious reading abilities associated with hyperlexia. Existing research is the result of attempts to assess the written word as a possible form of communication. Although several researchers have shown that even the most severely retarded individuals with autism are capable of learning to read single words (Duran, 1985; La Vigna, 1977; McGee, Krantz, & McClannahan, 1986), few have attempted to investigate what conditions enhance word learning or reading and writing beyond the single-word level.

An example of one of the communication training programs that have demonstrated word identification abilities in individuals with autism involved three adolescents described as "mute," and functioning below six years of age cognitively. They participated in a word-based communication training program (La Vigna, 1977) that involved matching printed words to referents, specifically three types of candy. Expressive mastery of three words was demonstrated

when the subject selected an appropriate label in response to the availability of the candy. Receptive mastery was demonstrated through the selection of the right candy when a word was presented. In a clinical setting, the subjects used the words with 90% accuracy in an average of 1,471 trials and 74 sessions. The instruction was repetitive and immediate primary and social reinforcers were used. Although it is encouraging to find that these three adolescents identified as severely and profoundly mentally retarded with no known potential for literacy acquisition did learn three words, the data shows that it took an incredible amount of time and concentrated effort. Subjects required 50 days of 20-30 minute sessions to master the three words expressively. Another eight days were necessary for that knowledge to be demonstrated receptively. In other words, a total of three months of intervention was devoted to learning to use three printed words given primary reinforcers and one-on-one instruction. Clearly this is a grossly inefficient way to approach one form of literacy-related instruction.

Rousseau, Krantz, Poulson, Kitson, and McClannahan (in press) did not study young or older adults, but the nature of their study makes it worthy of discussion here. The researchers set out to determine if sentence-combining activities could increase adjective use in the writing of students with autism. The three subjects with a mean age of 12.8 years participated in 40 minutes of daily instruction. In the multiple baseline design, they engaged in 20 minutes of worksheet and sentence-combining tasks and 20 minutes of writing in response to a prompt. Data collection involved counting the number of adjectives used by students during the writing task. The students were reinforced for each adjective they used through a program already in place in their classroom. All three of the students made significant gains during the course of the program.

Measures such as t-unit length revealed an average increase of 1.49 words per t-unit. That is more than double the average increase in t-unit expected for typically developing children between the ages of 4 and 12 (Hunt, 1977). A comparison of writing samples collected before and after the sentence-combining exercises indicated that the posttreatment samples were more sophisticated. The student writers used fewer repetitive phrases, more descriptive language, and greater variety in vocabulary.

The subjects in the Rousseau et al. (in press) study differed from those in La Vigna's (1977) study in one important way: They had received intensive literacy instruction for years, and had well-established reading and writing skills prior to participating in the study. However, the difference in prior experience and skill is outweighed by the nature of the treatment techniques utilized. The researchers were able to produce dramatic results by employing what is known about good literacy instruction for individuals without disabilities. On the other hand, La Vigna's decontextualized drill procedure, albeit not intended as literacy instruction, fails to incorporate what is known about best practices in early literacy instruction.

Other literature based on literacy development reflects the experiences and theories of professionals who have been involved in the education of individuals with autism (see Duran, 1985; Oppenheim, 1974). The literature is valuable in that it attempts to look beyond the communication and

behavioral concerns of autism, but it is important to remember that it is based in personal experience and professional judgment, not in empirical evidence.

Oppenheim (1974), the mother of a child with autism and subsequently a trained teacher, wrote a book that focuses on effective teaching techniques. Oppenheim argued that once control had been established, teaching could follow a path of hand-over-hand completion of a variety of tasks. Her emphasis on written words and literacy events is evident throughout the book. In working with nonspeaking children who are not reading, she used cards with individual responses written on each. The child was directed to indicate the appropriate response by pointing to the correct card. From the initial use of storybooks with response cards to enable interaction, to the use of cloze activities, to the use of cards to construct novel sentences, Oppenheim's techniques mirrored those used in the regular education classroom, while adapting for individual response modes. Oppenheim reports anecdotally that children taught in this fashion were able to learn to read without difficulty before developing speech.

In her clinical work, Duran (1985) developed a framework for teaching reading in context to severely retarded autistic adolescents of limited English proficiency. The author's description of instruction focuses on repetition of words in the context where they occur. Initially, instructors develop a word list and construct a notebook containing the words and pictures for the student to carry at all times. Through repetitions of pointing and saying the words, the student is to learn the words. Once the student has mastered single words, three-word sentences with descriptive pictures are introduced. The author suggests that sentences always follow the same subject-verb-object format. These sentences can then be used for assessment of progress when an instructor asks, "Which word says ____?" Duran does not provide any evidence of success in her article.

HYPERLEXIA

Hyperlexia is the precocious development of rote reading skills at a very young age in the absence of formal instruction (Silberberg & Silberberg, 1967) and often before the development of speech (Cobrinik, 1974; Frith & Snowling, 1983; Goldberg, 1987; Mehegan & Dreifuss, 1972; Whitehouse & Harris, 1984). It may be considered one form of the precocious abilities in specific areas noted in some individuals with autism (Cobrinik, 1974; Frith & Snowling, 1983; Goldberg, 1987; Mehegan & Dreifuss, 1972; Snowling & Frith, 1986; Whitehouse & Harris, 1984). For example, Raymond Babbitt, the man portrayed by Dustin Hoffman in the movie *Rain Man,* demonstrated precocious abilities in the computation and the counting skills required to win at casinos. Most often these abilities are found in memory tasks, calendar prediction, artistic expression, musical performance, computation, or reading (Cobrinik, 1974).

Specific characteristics of hyperlexia include:

- occurrence in conjunction with cognitive and/or language delays,
- onset of ability when the child is between 2-5 years old,
- onset of ability in the absence of direct instruction,

- perpetuation in a compulsive and indiscriminate manner, and
- word recognition skills that exceed that which is predicted or expected based on intelligence (Silberberg & Silberberg, 1967).

Acute visual imagery and recall are seen as necessary conditions to the development of hyperlexia (Cobrinik, 1974). Most often, hyperlexia is characterized by deficient reading comprehension skills in comparison to word recognition (Frith & Snowling, 1983; Mehegan & Dreifuss, 1972; Whitehouse & Harris, 1984).

The discrepancy between word recognition and reading comprehension led to a proposal that hyperlexia is related to dyslexia (De Hirsch, 1971). The two groups were actually found to be complementary when Frith and Snowling (1983) compared them on a wide range of oral reading tasks. The major difference was that individuals with hyperlexia seemed to have difficulty using semantic cues in context, while the subjects with dyslexia showed a superior ability to use semantic cues in context.

Snowling and Frith (1986) demonstrated that eight subjects with autism were able to use single words on several linguistic levels. They also differentiated abstract and concrete words as separate classes of semantic representation and had no problems with phonological and lexical strategies. On the other hand, the subjects did not demonstrate awareness of errors made while reading, and had difficulty when required to answer postreading questions. Their deficits in comprehension appeared to be related to an inability to abstract meaning from sentences especially in the absence of syntactic cues.

Whitehouse and Harris (1984) studied 20 males with autism and hyperlexia. The males, ranging in age from 13-25 years, had a broad range of IQ scores (20-144). The researchers examined records of the subjects' developmental history, intelligence test performance, word recognition skills, and reading achievement. In addition, parents were interviewed to gain information about the early onset of hyperlexia and other developmental issues. As children, all subjects demonstrated higher word recognition skills than would be expected based on IQ and chronological age. For 80% of the subjects, a pattern of superior word recognition skills in comparison to reading comprehension persisted through adulthood. None of the subjects appeared to use their reading abilities on their own initiative in functional ways. In some cases, teachers or parents were able to persuade the child to use the written word for communication, but subjects never did so independently. Finally, the investigation showed that the behavior pattern associated with hyperlexia appears to be independent of intellectual functioning.

Intellectual functioning, or mental age, appeared to be the contributing factor to performance on reading comprehension in a comparison of adolescents with autism, with and without mental retardation, and a control group with no disability (Snowling & Frith, 1986). The authors matched the subjects on mental age and completed four experiments. The first demonstrated that individuals with mental retardation can match pictures at a level commensurate with their verbal ability. The second experiment showed

that subjects with autism did not alter the pronunciation of homophones (i.e., words that sound alike but are spelled differently) based on the context of the sentence; however, this failure to disambiguate homophones was believed to be linked to mental age, not autism. In the third and fourth experiments, the subjects with autism and without retardation were able to extract meaning from sentences and stories as well as the nondisabled subjects.

The combined results of the four experiments lead to the conclusion that hyperlexia is not specific to autism. The key factor determining comprehension appears to be verbal ability, and the authors argue that the inability to comprehend larger units of meaning is the impairment that marks true hyperlexia.

FACILITATED COMMUNICATION

The literature on autism in the last three years has been dominated by the topic of facilitated communication (FC). Basically, FC is a technique that involves the use of physical and emotional support, coupled with an assumption of competence on the part of the individual with autism, to teach an individual to point in order to communicate (Hudson, 1992). Typically, FC is carried out by initiating backward pressure or resistance at the disabled individual's wrist, reportedly allowing the communicator to gain control over physically uncooperative limbs and point or type. In cases recorded in the literature, responses have been typed using letter boards, keyboards, and similar devices (Biklen et al., 1992). The reports of individual success in the popular press and qualitative research studies were overwhelming initially. Case studies of individuals who have suddenly emerged as communicators through spelling are abundant.

Although FC is being used throughout the country and around the world with individuals with autism and other disabilities, there is no sense of unconditional acceptance. In fact, FC faces considerable scrutiny at present. There are a variety of issues that have fueled the skepticism, with literacy underlying many of them. Success with FC typically is based on literacy skills (i.e., being able spell and construct semantically and syntactically appropriate sentences). In many of the reported success stories, individuals believed to have severe and profound retardation demonstrated well-developed literacy skills in the absence of literacy instruction.

The validity of the communication mode has been the driving force behind the vast majority of research to date. Most of the studies have been designed to determine who produced the message that was eventually typed by the subject with assistance from a facilitator. These validation studies have taken a variety of forms, but, with two exceptions (Calculator & Snyder, 1992; Cardinal & Hanson, 1994), each has clearly demonstrated that FC is not successful under controlled conditions. The following is a discussion of the experimental research that exists to date. The studies will be discussed within the context of the type of procedure that was used. The four types of procedures used in the validation studies are as follows: (a) use of distractor items (i.e., facilitator sees or hears information that differs from communicator), (b) visually blind (i.e., facilitator cannot see picture that communicator sees), (c) event blind (i.e.,

facilitator does not participate in event that communicator will describe), and (d) auditory blind (i.e., facilitator cannot hear the information that communicator hears).

One of the first experimental studies was completed by Wheeler, Jacobson, Paglieri, and Schwartz (1993). Facilitators were shown distractor pictures on some trials and the same picture as the communicator on other trials. Correct labels for pictures were only provided when facilitators and communicators were shown the same pictures. When distractors were used, the responses produced by the communicators reflected the picture shown to the facilitator. This was interpreted as demonstrating that the facilitator was actually controlling the responses provided by the subject.

In a similar study, Szempruch and Jacobson (1992) used a quasi-experimental, message-passing design to assess the validity of communication for a group of mentally retarded adults with and without autism. The study differed from Wheeler et al. (1993) in that it was intended to involve a communication-based task and occurred in a natural, familiar, and supportive environment. In this study, the subjects were asked to label or describe a picture to a facilitator. The facilitator, blind to both the event and the visual stimuli, did not enter the room until after the subjects had seen the pictures. None of the subjects was able to provide accurate labels or descriptions.

There are two published reports of single subject validation studies (Hudson, Melita, & Arnold, 1993; Shane & Kearns, in press). Both were initiated as a result of messages produced through FC alleging that the subjects were victims of sexual abuse. The validation studies are by-products of the evaluations that took place to determine whether or not the subjects had authored the messages. The fact that both subjects required physical support to type messages led to questions regarding the origination of the message content.

The 38-year-old man with severe mental retardation in the Shane and Kearns (1993) study communicated through FC with physical support to his hand. In the study, the facilitator saw the same stimuli as the subject for half of the words, pictures, and questions given to the subject, and saw different stimuli for the other half. In the shared condition (i.e., facilitator saw same stimuli), the subject was able to respond correctly to 80% of the words and 85% of the pictures. In the unshared condition (i.e., facilitator saw distractor), the responses were 100% incorrect. In fact, all nine of the responses to the pictures matched the distractors that were shown to the facilitator. In the condition that required the subject to answer questions asked in relation to a picture, all of the shared questions (i.e., facilitator hears same question) were answered correctly and all of the unshared questions (i.e., facilitator hears a distractor question) were answered incorrectly. Again, the results reflected the questions asked of the facilitator rather than the questions asked of the subject. Finally, in an object-labeling condition, the facilitator was visually blind to the objects. In this blind condition, all responses were unintelligible or off target.

The facilitator was auditory blind in the validation of messages communicated by a 29-year-old woman with severe/profound mental retardation through FC (Hudson et al., 1993). The subject responded to

questions in four different conditions. In the first two conditions, the facilitator and subject heard the same questions. The conditions differed in the fact that condition two presented questions on a tape recorder. Results from the two experiments indicate that the tape recorder decreased performance (8 of 10 correct in baseline, 4 of 10 correct with introduction of tape recorder). When the facilitator and subject heard questions presented in a different order (a distractor condition), the responses were all incorrect, with four reflecting the question presented to the facilitator. In the final condition, the facilitator heard music while the subject heard questions. No correct responses were produced.

The studies just reviewed have been replicated no less than 25 times. Each of the replications has produced similar results—subjects have been unsuccessful, and the validity of facilitated communication has been called into question. However, myriad problems exist with these studies. Within the context of FC, each study sparks concern over its violation of some of the basic tenets of the technique. In particular, the distractor methods interfere with the natural inferencing processes that occur in communication. Each of the blind methods interfere by stripping away contextual and communicative support. Without a communicative context, support, and the ability of speaker and listener to infer meaning within communication attempts, communication is doomed to be less than effective.

A further problem with the validity studies reviewed is that they focus solely on validity in terms of authorship. The validity question must be extended beyond who is the author of the message. Another validation question worthy of investigation includes whether the method is valid or appropriate for a given individual. Other important questions have likewise been ignored. For example, many individuals with autism have been reported to engage in less disruptive behavior once facilitated communication is introduced. Given Prizant and Schuler's (1987) argument that the aberrant behaviors reported in individuals with autism are in part due to their inability to communicate, decreases in aberrant behaviors might be taken as evidence of authorship. At the very least, it is worth investigating whether such claims are true, how widespread they are, to what they are attributable, and whether they can be transferred to other individuals using similar or different techniques.

The validation studies mentioned above have also been criticized for their failure to examine individuals' use of facilitated communication across contexts or over time. A recently completed experimental study (Cardinal & Hanson, 1994) addressed these and several other problems mentioned above. The 43 subjects, ranging in age from 11-22, had a variety of severe disabilities, including autism. They were tested three times per week for six weeks. Each test included five trials. The protocol for the trials was as follows:

- a recorder showed the subject a word on a flash card and said the word,
- the recorder asked the facilitator to come into the room,
- the facilitator asked the subject to type the word just seen,
- the facilitator called out the letters exactly as the subject typed them while the recorder wrote them,
- the student was given the same positive comment regardless of the answer, and

- the facilitator left the room so the process could be repeated.

The investigators collected baseline data without facilitated communication before the study and again six weeks after the study. Students who were able to type more than one word without facilitation during the initial baseline were not included in the study. Preliminary results indicate that 48% of the 43 subjects who participated in the study were able to type the word, without error, at least two of five times during a session at the end of six weeks. Thirty-three percent were able to type at least three of five words, without error, by the end of six weeks.

This single study does not prove the validity of facilitated communication, nor does it disprove the findings of the other experimental, validation studies. However, it does suggest that given the opportunity to practice the protocol with a familiar facilitator in a familiar setting, individuals are able to generate output that is completely originated by the facilitated communicator. The importance of practice is supported by Bauman (1994), whose research on the neuropathology of autism suggests that training may be an effective way to get a better measure of performance for individuals with autism.

Prior to the study by Cardinal and Hanson, support for facilitated communication resulted largely from qualitative research. These qualitative studies offer the following as proof that the messages produced via facilitated communication are indeed those of the communicators:

- each individual has a unique style, speed, and accuracy of movement, which is consistent across facilitators;
- individuals have unique typographical errors;
- individuals who share a facilitator have invented spellings and phonetic irregularities that are unique;
- individuals type unusual phrases that would not be expected from the facilitator;
- individuals type content that is unknown to the facilitator; and
- individuals reveal their personalities (Biklen et al., 1992; Calculator & Snyder, 1992).

Calculator and Snyder (1992) were the first to provide empirical, albeit preliminary, support for the efficacy of facilitated communication. They administered the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981) with and without facilitation to five school-aged boys with autism. All of the boys were nonspeaking. The results indicated that three of the five students demonstrated dramatic improvement in test scores with facilitation. Although the study did not involve validation of communication in written form (literacy), it does suggest that facilitation can make a substantial difference in the responses of some individuals with autism.

It is not within the realm of this paper to either support or deny the efficacy of facilitated communication. Many researchers have provided clear evidence under controlled conditions that the communication attempts are not owned by the communicator. Others are amassing qualitative and descriptive

evidence that facilitated communication is making a difference in the lives of individuals with autism, their families, and their instructors. This supportive evidence is bolstered by recent experimental data indicating the validity of facilitated communication.

The argument regarding facilitated communication is not likely to be resolved anytime soon. In the meantime, it is critical to note that decisions regarding the appropriateness of facilitated communication must be made on an individual basis. Even when it is deemed appropriate, the training must not preclude other forms of literacy and communication training that may prove to be more appropriate.

CONCLUSIONS

The number of questions and areas of research that have been untapped regarding literacy and individuals with autism obviously are countless, given the minimal research to date. It is clear from the little research that does exist that some individuals with autism can, and do, learn to read. As posited by La Vigna (1977), the spatial nature of the written word may cater to the dominant visual perception skills of individuals with autism without taxing the auditory perception required for the temporal, spoken word. It may also be that the nontransient nature of the written word limits the need for sequential processing and retention (Prizant & Schuler, 1987). These are positions that lack empirical support, but they have the potential to significantly impact the types of instruction and experiences that individuals with autism are provided.

ADULTS AND ADOLESCENTS WITH COGNITIVE IMPAIRMENTS

The definition of mental retardation is evolving. Most recently, the American Association on Mental Retardation published a definition that is more precise and behavior oriented than definitions of the past. The new definition is meant to assist in diagnosis and habilitation. Specifically, the definition reads, "Mental retardation refers to substantial limitations in present functioning. It is characterized by significantly subaverage intellectual functioning, existing concurrently with related limitations in two or more of the following applicable adaptive skill areas: communication, self-care, home living, social skills, community use, self-direction, health and safety, functional academics, leisure, and work. Mental retardation manifests itself before age 18" (American Association on Mental Retardation, 1992).

This new definition is intended to replace myriad terms that have been used to categorize and describe individuals with cognitive impairments in the past. Two of the most typical schemes for categorization have used the terms mild, moderate, and severe or educable mentally retarded (EMR), trainable mentally retarded (TMR), and severely mentally retarded. These preexisting schemata attempt to describe individuals in terms of their intellectual functioning. Basically, an individual identified as EMR or mildly to moderately mentally retarded is believed to be able to learn basic academic and self-help skills. An individual identified as TMR or moderately mentally retarded is believed to be able to master only the most rudimentary academic skills and self-help skills. Finally, individuals identified as severely or profoundly mentally retarded would be expected to master only limited self-help skills and few, if any, academic skills. Despite significant subaverage intellectual functioning and other

limitations, some individuals with cognitive impairments have demonstrated an ability to acquire literacy skills. Although the research has been somewhat limited in scope, it is full of examples of successful attempts to teach basic reading skills. Dating as far back as 1924, researchers have supported teaching a functional, or "protective," vocabulary to children who were labeled educable mentally retarded (EMR) (Wallin, 1924). By 1960, it was believed that children who were EMR could acquire reading skills as high as the second- or third-grade level (Perry, 1960). At that time, the prevailing view held that individuals labeled as trainable mentally retarded (TMR) could not be taught to read, and little work was done to prove otherwise. In the early 1970s, some researchers began to discover that individuals labeled TMR could learn basic sight words, and even speculated that they could acquire more sophisticated reading skills (D'Amelio, 1971; Kirk, 1972).

The following discussion is organized around five categories of existing research in literacy and individuals with cognitive impairments: (a) letter, sound, and word acquisition; (b) group size and instructional efficacy; (c) oral reading and oral reading error correction; (d) reading comprehension; and (e) writing.

LETTER, SOUND, AND WORD ACQUISITION

Once it was established that individuals with mental retardation could learn sight words, energy was directed at determining the most effective instructional techniques. Although Blackman and Holden (1963) had demonstrated that prompting (i.e., previewing the correct response) did not yield greater results than confirmation, a nonsupportive technique, the 1970s brought an influx of projects designed to determine if prompting, reinforcement, fading, and other techniques might influence sight word acquisition.

Brown and Perlmutter (1971) examined responses to written words in their study of the effectiveness of positive reinforcement. The seven adolescents in their study, all with moderate mental retardation, were required to identify printed words and do what the words indicated in order to meet the criteria for functional reading. The subjects were able to label and respond differentially to nine different words after 60 hours of instruction. Although there was no comparison group, 60 hours is a substantial investment for the learning of nine printed words. The authors' conclusion that reinforcement is an effective instructional technique warrants further investigation in the context of adult literacy programs.

Throughout the next several years, studies involving children with cognitive impairments demonstrated that fading and prompting techniques were successful in teaching sight words (e.g., Dorry & Zeaman, 1973, 1975). The first study involving adults or adolescents was designed to explain why fading was a successful technique in teaching sight words to individuals with moderate mental retardation (Dorry, 1976). Forty-eight subjects (mean age = 21.3 years) were assigned to four groups matched for IQ and chronological age. The four conditions were designed to test the stimulus change hypothesis (i.e., that fading-in is effective because of the increased salience of the word) versus the attentional hypothesis (i.e., that fading-out is effective because increased attention is given to the word as a result of fading the picture). Using a combination of word and picture

fading, the researchers were able to determine that the picture fading condition produced the most significant results. The importance of picture fading, not word fading, supports the attentional hypothesis as an explanation for the effectiveness of fading.

Another sight word instructional strategy involved the pairing of sign language and printed words (Sensenig, Mazeika, & Topf, 1989). Fifteen adolescents were involved in an across-subjects, counter-balanced design that compared their ability to learn, remember, and recall printed words learned with and without accompanying sign language representations. The subjects were selected for their ability to read single words only or no words at all. Treatment involved presentation of flashcards and imitation of the verbal match in the nonsign condition, and imitation of the verbal match and sign in the sign condition. The subjects demonstrated significantly more improvement in the sign condition than they did in the nonsign condition. The investigators also determined that the number of words learned, remembered, and recalled in the sign and word condition correlated with duration of instruction and not level of intelligence of the subject.

Three different methods of instruction were compared in a study by Barudin and Hourcade (1990). These researchers compared a visual sight word, picture fading, and tactile kinesthetic approach. Subjects were 32 adolescents with moderate to severe mental retardation. They were described as nonreaders based upon performance on a pretest of the five words (no more than one correctly identified word). The five words eventually served as the transfer words in a test of reading skill generalization. All three approaches yielded better results than the control, no instruction, but there were no significant differences between the three. Regardless of the technique used, subjects were able to acquire 10 words over four days of 30-minute sessions. By the end of four days, however, differences emerged in recall and transfer. Both the tactile-kinesthetic and fading approaches appeared to be superior to the sight word approach for recall and transfer.

Six young adults participated in a study that compared task demonstration and the standard system of least prompts (i.e., initially providing no prompt and progressing through verbal and physical prompts as needed) in teaching word identification (Karsh, Repp, & Lenz, 1990). The task demonstration model involved a fading technique that presented both the correct and incorrect version of a word and systematically increased their similarity. The system of least prompts involved a least-to-most intrusive prompting hierarchy. The counterbalanced design showed that task demonstration produced fewer errors in acquisition, generalization, and maintenance of words.

The research emphasis on techniques to enhance sight word acquisition may be driven by the difficulties that individuals with cognitive impairments appear to experience when they face phonetic approaches to reading. Hoogeveen, Smeets, and van der Houven (1987) investigated these apparent phonetic difficulties through the use of action mnemonics (e.g., a picture of a snake in the shape of an "s") by adolescents with moderate mental retardation, in learning Dutch letter-sound correspondences. The seven subjects in the modified multiple probe study were selected based on teacher reports of difficulty learning letter-sound correspondences. The goal was to teach subjects to emit the correct phoneme when presented with a picture. Initially the graphemes were embedded in the mnemonic. The mnemonic was systematically

faded during the course of the training. All subjects were able to learn 12 letter-sound correspondences in an average of 5.45 hours. Follow-up probes 14 and 100 days after treatment ended revealed that subjects retained their skills at a rate of 99.8% and 84.6% respectively. Given this mnemonic approach, the subjects demonstrated that a phonetic approach is not futile.

In a follow-up study, Hoogeveen, Kouwenhoven, and Smeets (1987) investigated the subjects' ability to blend the phonemes. In this study, the question investigated was whether the blending problems reportedly experienced by so many individuals with mental retardation were due to the requirements of the task or to an inadequate instructional terminology. Twenty nonreading adolescents received instructional training that was designed to insure understanding of the directions. Although their performance increased, the increase did not vary as a result of type of training. While instructional training did not produce any statistically significant results, the increased performance may have instructional relevance for the use of training as a preliminary exercise in a phonemic approach to reading instruction. In the second half of the study, the 20 subjects demonstrated that the use of picture prompts led to initial success in learning new words, but later produced problems when the pictures were removed. Meanwhile, subjects who had no pictures initially, experienced problems in their initial attempts to learn words, but had relatively fewer problems later.

Incidental learning was the focus of a study employing four experimental conditions in the teaching of words related to kitchen tasks (Gast, Doyle, Wolery, Ault, & Farmer, 1991). The four conditions were designed to differentiate between information that was taught directly and that which was embedded in various instructional paradigms. The conditions were the following:

- progressive time delay (i.e., systematic increase of time between presentation of word and verbal model of word),
- progressive time delay with descriptive verbal praise (i.e., as above with addition of praise indicating precisely what was done right),
- system of least prompts (i.e., progress from presentation of verbal directions alone to directions paired with gestures, to pairing with pictures, and to pairing with spoken model), and
- system of least prompts with descriptive verbal praise (i.e., as above with addition of praise indicating precisely what was done right).

Each of the four conditions led to word learning and maintenance. Incidental learning resulted when the words were embedded in the prompt hierarchy or descriptive praise statements of other subjects' response prompts.

One final area of research regarding sight word acquisition deals with the use of technology and computer-assisted instruction. When Blackman and Capobianco (1965) first addressed this issue, the technology in question was a teaching machine. The investigators used matched groups of young adults

with first-grade reading levels and taught them sight words in two conditions. One group was taught using a traditional, teacher-directed, whole class technique and the other used teaching machines. No significant group differences were found. Both groups made significant progress during the course of the study.

Baumgart and Van Walleghem (1987) compared teacher guidance and computer-assisted instruction as methods for teaching sight words to three adults with moderate mental retardation. In an alternating treatments design, the investigators found no difference between the two approaches in terms of number of words recognized on a generalization task (recognizing words at a store). However, two of the subjects were able to learn the words through the computer-assisted approach almost as quickly as the teacher-guidance approach. The other subject was not able to learn the first five words in the computer-assisted approach (in 22 sessions), but was able to learn all of the words in the teacher-guidance approach (in nine sessions). Despite the fact that the overall test of significance revealed no difference, information gathered in this study has instructional relevance. These findings support the existence of different individual learning styles. If a student is having difficulty learning in a given format (in this case, computer-based), it seems reasonable to try a different alternative. When computers are available and can produce results equal to those produced by one-on-one instruction with a teacher, it may become more cost efficient to use them. Identifying the individual differences that lead to the success of computer-assisted word learning is critical if it is to be implemented effectively in adult literacy instruction.

Conners and Detterman (1987) conducted a study of 19 subjects with moderate to severe mental retardation in order to look at performance in computer-assisted learning and seven measures of cognitive ability. Results indicated that individual differences should be taken into account when designing instruction. Specifically, it was demonstrated that word-learning performance was dependent on the subject's ability to encode and discriminate stimuli, short-term memory skills, and ability to profit from repeated trials with feedback.

Having demonstrated the impact of individual differences on computer-assisted word learning, Conners (1990) next attempted to assess the impact of individual differences in stimulus discrimination and simple learning skills. Twenty-five young adults with moderate mental retardation participated in this repeated measures study. The results indicated an interaction between skill in stimulus discrimination and the number of words that should be presented for learning at any one time. In particular, subjects with good stimulus discrimination skills learned more words when they were presented four at a time than when they were presented two at a time. The opposite was true for the subjects with poor stimulus discrimination skills.

GROUP SIZE AND INSTRUCTIONAL EFFICACY

Special education is often characterized by one-on-one instruction. All of the studies reviewed thus far, with the exception of Gast et al. (1991), have involved teaching subjects sight words in a one-on-one, teacher-student relationship. The focus of the following studies, on the other hand, is learning in group contexts. Favell, Favell, and McGimsey (1978) compared small group instruction and individual instruction as methods for teaching sight words. The

subjects, 16 adolescents with severe mental retardation, had limited word recognition prior to the study. They were randomly assigned to four groups (two groups receiving individual training and two receiving group training). In terms of effectiveness, no significant differences were found. The individually and group trained subjects required the same number of trials and sessions-to-criterion. In terms of use of teacher time, the group training was significantly more efficient with subjects learning one word per hour of teacher time versus the 0.03 words per hour learned in the individual training.

Another examination of the effectiveness of group instruction (Farmer, Gast, Wolery, & Winterling, 1991) focused on observational learning. Three subjects with severe mental retardation were taught sight words in a group format using a progressive time delay procedure. The progressive time delay procedure requires presenting an unfamiliar target word and systematically increasing the length of time before the teacher provides a verbal model of the word. All subjects learned the eight target words, and the group format was deemed successful in terms of observational learning because two of the three subjects learned words incidentally during the group instruction.

It appears that group instruction can be more efficient than individual instruction because greater opportunity for incidental learning occurs. It seems logical that educators would want to foster incidental learning throughout the day. In a study related to this issue, six adolescents and young adults with moderate to severe mental retardation participated in a token economy that gave the teacher opportunities to present targeted words two at a time at predetermined intervals throughout the day when subjects exchanged tokens (Fabry, Mayhew, & Hanson, 1984). The approach proved to be effective with some of the students but not all. The results indicate that the incidental approach was an effective addition to systematic instruction because it increased the number of teaching opportunities in a day. However, incidental teaching should not be viewed as a replacement for direct instruction since not all of the students learned through the incidental exposures to the words and others progressed slowly.

ORAL READING AND ERROR CORRECTION

Oral reading is frequently employed in literacy instruction, especially for young children beginning to learn to read. Often it is used as a means of evaluation for the instructor. However, oral reading has been suggested as a means for improving comprehension. Chang; Williams, and McLaughlin (1983) evaluated the usefulness of oral reading in improving the comprehension of eleven subjects, nine with severe learning disabilities and two labeled educably mentally retarded. The subjects ranged in age from 14 to 21 years and demonstrated reading grade-level scores between 2.8 and 7.5 on the *Wide Range Achievement Test* (Jastak, Bijou, & Jastak, 1965). In the first of two experimental conditions, students silently read and answered comprehension questions for at least 14 selections. In the second condition, the students read the selections orally. If students made any errors, they were corrected and asked to repeat the correction before continuing and answering questions. Results suggest that oral reading did improve comprehension for students with low reading abilities, but the technique became less effective as reading skill increased. The investigators suggest that oral reading should be

used as an instructional technique based on the reading ability of the student and not chronological age.

Singh and Singh have been involved in a progression of studies addressing error correction in oral reading. In 1984, they assessed the effects of previewing target and nontarget texts on oral reading errors and self-corrections (Singh & Singh, 1984). Four adolescents, ages 14-17 years, with moderate mental retardation participated in the alternating treatments design. In the first condition, previewing, the teacher provided background information and discussed the story with the student prior to reading the 100-word text. In the nontarget preview condition, the teacher spent the same amount of time providing background for, and discussing, a story unrelated to the one the student would be reading. Finally, in the control condition, no background or discussion preceded the reading. The only condition that led to reduced errors was previewing the targeted text. This three-treatment design allowed investigators to conclude that it was the actual text preview and not simply the time spent one-on-one with the teacher that led to the reduction in errors.

In a second study with four subjects of similar age, intellectual functioning, and reading ability, Singh, Singh, and Winton (1984) compared positive practice with and without positive reinforcement as a means to reduce oral reading errors and increase self-corrections. In an alternating treatments design, the investigators again compared three conditions. In the positive practice condition, the subjects were told to read a story and instructed to do the best they could. If they made an error, they were corrected and instructed to repeat the correct word five times before continuing. In the positive practice plus positive reinforcement condition, subjects were given praise and an edible reinforcer for their self-corrections. Although the positive practice with positive reinforcement condition led to the greatest decrease in uncorrected oral reading errors, positive practice alone produced significant decreases in uncorrected oral reading errors.

The investigators then compared the effectiveness of positive practice and drill in reducing oral reading errors (Singh & Singh, 1986). The three subjects, ages 15-17 years, with moderate mental retardation participated in each of the three conditions in a randomized order. Directions for each condition differed such that it was believed the subjects could differentiate between the conditions. In the positive practice condition, errors were corrected by the experimenter. The student was told to listen and point to the word in the book as it was read for them. Then the student repeated the word five times before reading the sentence again. In the drill condition, the student was told the correct word when an error was made. At the end of the passage, all of the words read incorrectly were printed on cards and practiced until they could be read without errors. In the control condition, no assistance was provided, errors were not corrected, and praise was not given for self-corrections. The two experimental conditions were significantly more effective than the control condition; however, the positive practice condition was superior overall.

While attempting to determine how oral reading errors could be reduced, error correction procedures were also studied. Using error reductions as a measure of effectiveness, Singh and Singh (1985) compared word supply and word analysis procedures in an alternating treatments design. In the word supply and the word analysis treatments, the four subjects were told that they would receive help if needed. Help consisted of the instructor saying the word

as the subject pointed to it in the book in the word supply treatment. In the word analysis treatments, the instructor helped the subject apply letter-sound strategies to identify the word. In both treatments, the subjects had to read the word correctly before moving on. In the control treatment, the student was asked to read the passage and try not to make any errors and received no instructor assistance or feedback. Both the word supply and analysis treatments decreased oral reading errors when compared to baseline and control. Word analysis produced the greatest reductions in error. For two of the subjects, word analysis also led to significant increases in self-corrections. In a subsequent investigation, Singh (1990) compared word supply to a sentence-repeat strategy. When a student made an error in the sentence-repeat condition, the teacher read the word while the subject the pointed to it in the text. Then the student said the word correctly, finished reading the sentence, and read the entire sentence again. Although word supply was effective in reducing oral reading errors, the sentence-repeat strategy was most effective in improving the oral reading of the three adolescents, ages 13-15, with moderate mental retardation.

READING COMPREHENSION

Relatively little effort has been focused on comprehension and text-level skills in comparison to the word-level studies, but some information does exist. Ramanaukas (1972) used a repeated measures design with 58 subjects to assess their ability to demonstrate comprehension by responding to text rather than the single word and immediate context. Subjects with reading scores of grade 2.5 or higher, as measured on the *Wide Range Achievement Test* (Jastak, Bijou, & Jastak, 1965), were presented tasks with sentences appearing in naturally and unnaturally occurring order. Results suggested that subjects were responding to context at the paragraph level, and passages with sentences in naturally occurring order led to the highest number of correct responses.

Crossland (1981) compared the responses of 15 adolescents with mild or moderate mental retardation to 15 control subjects matched for mental age in a reading comprehension task. Both groups had to supply the missing words in passages that had words systematically deleted. There were no significant differences between groups in terms of total scores. However, the control group supplied significantly more exact* and grammatically correct words. These results were interpreted as evidence that individuals with mental retardation have difficulty using context in reading.

Seventy-five subjects participated in a study that assessed the effects of three different types of teacher questions on the thought processes and subsequent test scores of individuals with mental retardation (Belch, 1978). The subjects were assigned to one of three matched groups. One group read passages and answered 10-15 higher order written questions throughout the treatment phase. A second group read passages and answered 10-15 lower order written questions. Finally, a control group read passages and indicated whether they liked or disliked the story. Subjects who had answered higher order questions outperformed the other two groups on the reading

*An error is found in Table 2 of the original article where the means for the subjects with and without retardation are reversed. Although no correction has ever been printed, Dr. Crossland confirmed the error in a fax to the authors, September 7, 1993.

comprehension section of the *Comprehensive Test of Basic Skills* (1969). There were no significant differences between the other two groups. Asking lower order questions was no more effective in improving comprehension scores than asking, "Did you like the story you just read?"

WRITING

It has been widely argued that writing should be an integral part of literacy programs for nondisabled children. Reading and writing skills develop concomitantly and growth in one can foster growth in the other (Shanahan & Lomax, 1986, 1988). Nonetheless, writing has yet to receive much research attention in relation to individuals with cognitive impairments. Furthermore, a large percentage of what does exist does not address issues of content, style, or form. In one study, writing was looked at in relation to its effectiveness in promoting sight word recognition (Calhoun, 1985). Seven subjects participated alternately in a typing treatment and a handwriting treatment. The investigator wanted to know whether handwriting or typing activities would produce higher scores on tests of word recognition. The findings revealed no differences between the treatments in terms of number of words recognized, but the typing treatment led to significantly fewer errors during the treatment phase.

While it may be important to know whether typing or handwriting activities can lead to an increased sight word vocabulary, the study tells us little about the actual writing of individuals with cognitive impairments. Farley (1986) looked more closely at writing content by analyzing the journal entries of six adolescents identified as educably mentally retarded. The analysis focused on the range and frequency of topics, but the investigator also looked at language functions, syntactic structures, spelling, and punctuation. Subjects chose topics that were commensurate with their chronological age, not their reported mental age. The analysis of the other areas revealed a great deal of variation by individual, while all subjects demonstrated use of a wide range of language functions.

CONCLUSIONS

While the scope of research in literacy and adults with cognitive impairments is limited, the sheer quantity of published studies indicate that adults and adolescents with cognitive impairments have received greater research attention than have others with developmental disabilities. Subjects with a wide range of cognitive skills have demonstrated the ability to learn single words in a variety of contexts under a variety of conditions. They have, however, been asked to demonstrate little regarding their ability to engage text beyond the single word or sentence level. The few studies that have investigated areas such as reading comprehension and generative writing appear to indicate that individuals with significant cognitive impairments can, and do, demonstrate higher level literacy competencies when provided with appropriate instruction, experiences, and opportunities.

ADULTS AND ADOLESCENTS WITH CEREBRAL PALSY

Cerebral palsy (CP) is a developmental neuromotor disorder that is the result of a nonprogressive abnormality of the developing brain (Hardy, 1983). The primary causes of CP include neonatal complications such as asphyxia or prematurity, later pregnancy complications such as fetal-placental exchange,

complications in labor and delivery, events in the first trimester such as intrauterine infection, and early childhood events such as meningitis or head trauma (Batshaw & Perret, 1986). The incidence of CP is estimated at 2-2.5/1,000 live births with precise adult prevalence figures difficult to obtain (Erenberg, 1984; Lord, 1984). Because of the subsequent motor problems associated with CP, individuals may find speech and writing difficult or impossible.

The population of individuals with CP, particularly those with severe speech and physical impairments, has recently begun to receive a great deal of attention in the literature. Although descriptive research concerning individuals with cerebral palsy and other physical disabilities existed in the early part of the century, it is only within the last few years that a concentrated effort has been made to gain an empirical understanding of individuals with CP. Before pursuing a review of the existing research, it is important to clarify two descriptors frequently found in literacy studies involving individuals with CP: severe speech impairments and severe physical impairments. Severe speech impairments are attributable to physical, neuromuscular, cognitive, or emotional deficits, are not due primarily to hearing impairment, and prevent individuals from using speech independently as their primary means of communication (i.e., these individuals cannot be easily understood by people who come into casual contact with them) (Lindsay, Cambria, McNaughton, & Warrick, 1986). Severe physical impairments may be congenital or acquired and may also impair speech, nonverbal communication, and writing as a result of problems with muscle tone, posture, and involuntary movements (Koppenhaver & Yoder, 1992). Children with severe speech and physical impairments began receiving sustained research attention in the late 1980s with the establishment of the Carolina Literacy Center at the University of North Carolina at Chapel Hill and efforts from a small group of researchers primarily from within the field of augmentative and alternative communication (i.e., the study of methods of communication for individuals who either are unable to speak or unable to speak clearly).

While nearly half of the nondisabled adult American population, or close to 100 million people, has not learned to read and write adequately to perform many common tasks in the workplace (Kirsch et al., 1993), the problem is even more severe among individuals with CP (Seidel, Chadwick, & Rutter, 1975). Several studies of children and adults with CP in the United States and abroad have revealed that between 50 and 100% cannot read at all or read far below expectations for nondisabled persons of the same age (Asher & Schonell, 1950; Barsch & Rudell, 1962; Center & Ward, 1984; Seidel et al., 1975; Smith, 1989; Wolfe, 1950). Percentages have varied depending on the sample selected and the subjects' relative degrees of speech, physical, cognitive, health, or other impairments.

Much of the research addressing children with CP describes reading abilities in relation to nondisabled peers and seeks to explain the discrepancies (e.g., Berninger & Gans, 1986; Seidel et al., 1975). There is a dearth of information available regarding instructional techniques and outcomes. When the focus is on adults, the amount of information available is limited further. Over the past decade and particularly in the last five years,

there has been steadily increasing literacy research attention directed toward individuals with CP (see, e.g., Koppenhaver, Coleman, Steelman, & Yoder, 1992).

The current interest in literacy and CP can be attributed to the same factors that have made literacy research more prominent in the field of developmental disabilities in general—legislation, emergent literacy research and a general expansion of the knowledge base, and technological advances. The technological advances most effecting individuals with CP are in the realm of augmentative and alternative communication (AAC). AAC technologies and techniques have made it possible for many individuals with severe speech impairments to demonstrate their cognitive competence and has allowed others to progress beyond the initial expectations of parents, researchers, or practitioners. AAC has also opened the doors to literacy for many who had been previously unable to access reading and writing, by providing them a means to communicate with their peers, their parents, their teachers, and others in the communities.

The following discussion will consider the existing research in literacy and individuals with CP in three broad categories: (a) characterizing the literacy performance of individuals with CP, (b) searching for within-individual causes, and (c) identifying effective instructional strategies and contexts. Again, only research involving subjects with an average age of 14 years or more has been included.

LITERACY CHARACTERISTICS

The first descriptive literacy studies of individuals with CP appeared in 1950. At that time, Asher and Schonell (1950) and Wolfe (1950) gathered data on large groups of children with CP (340 and 50 respectively) and characterized the similarities of members of the groups. Each study reported that less than 35% of the subjects had acquired even rudimentary literacy skills. Asher and Schonell used word recognition in isolation tests as their criteria of literacy. Had they chosen a measure of reading comprehension, the results would likely have been even poorer and more disturbing. Wolfe did not operationalize his definition of "severe reading disability," a category into which 86% of the sample fell, and it is unclear how well the 14% who did not fall into that category could read. Despite the two studies' flaws, they documented for the first time the severity and comprehensiveness of literacy learning difficulties in individuals with CP. Other demographic studies since that time have continued to report similarly severe and widespread literacy difficulties in persons with CP (e.g., Barsch & Rudell, 1962; Center & Ward, 1984; Seidel et al., 1975).

More recently Kelford Smith, Thurston, Light, Parnes, and O'Keefe (1989) sought to characterize the nature of writing produced on word processors by six adolescents and adults, ages 13-22 years, with severe CP. All writings produced over a four-week period were collected and analyzed for their forms and purposes. The subjects were found to use written communication for a variety of personal and social purposes including studying and learning (e.g., homework), maintaining friendships (e.g., letter writing), creative expression (e.g., poetry), reflection (e.g., journals), and memory assistance. All of the subjects, while writing independently for their own purposes, evidenced continued difficulties in producing conventionally appropriate output. Incorrect

usage of grammatical morphemes (e.g., nouns or endings, articles) and difficulties with compound and complex sentence structure were common.

WITHIN-INDIVIDUAL CAUSES OF LITERACY LEARNING DIFFICULTIES

Once the presence of literacy learning difficulties in persons with CP was established, researchers began searching for the causes of these difficulties. This search to date has been almost exclusively focused on within-individual causes. One line of study has focused on the ability of congenitally dysarthric (i.e., individuals who have difficulties speaking clearly) and anarthric (i.e., individuals who cannot speak) adolescents and adults to recognize phonemes and phoneme-grapheme relationships in a variety of spelling and word identification tasks (Bishop, 1985; Bishop, Brown, & Robson, 1990; Bishop & Robson, 1989a, 1989b; Foley, 1989). In essence, this research suggests that both dysarthric and anarthric individuals both possess phoneme awareness and use the same processes in completing phoneme-grapheme tasks. It has been proposed that the difficulties evidenced by nonspeaking individuals in learning new words may be due to an inability to rehearse either overtly or covertly (Bishop, Brown, & Robson, 1990).

Other researchers have looked for correlations between performance on a variety of reading tasks and various characteristics of the individual. Dorman (1987) used a correlational design in identifying the relationship between cognitive skills and reading and found that word recognition and passage comprehension both correlated significantly with verbal IQ. In an earlier correlational study, Dorman, Hurley, and Laatsch (1984) found that reading and spelling performance could be predicted using neuropsychological measures. Jones et al. (1966) attempted to find a link between the disordered eye movements of individuals with CP and reading performance. Eye examinations of 28 adults conducted as they read short passages suggested that disordered eye movements may have a greater impact on reading speed than comprehension. Berninger and Gans (1986) administered a battery of oral and written language assessments to a 40-year-old adult with CP, severe speech impairments, and normal intelligence. He performed well on subword, single-word, and sentence-level tasks but could not complete text-level comprehension tasks. Testing was not adequate to suggest why this was the case.

EFFECTIVE INSTRUCTIONAL STRATEGIES AND CONTEXTS

A more recent line of study has been focused on developing instructional strategies or identifying the contexts that support literacy learning in adults with CP. Gipe, Duffy, and Richards (1993) present a case description of a literacy tutorial program that was developed in response to the needs of an adult with severe CP who had never attended school or been taught a formal means of communication. At his initial visits to the tutoring program, he demonstrated the abilities to identify 60 sight words by location on his communication board, to print his name, and to communicate by gesturing, answering yes-no questions, and by pointing to letters and words on a communication board. His listening comprehension level was at the primer level and he was unable to read text independently. Responding to the individual's personal interests and goals and subscribing to a whole language belief, the authors developed an instructional program focused on developing semantic, syntactic, and graphophonic understandings and skills.

Instructional activities included written conversations, development of a personal dictionary, language experiences, multisensory phonics, directed listening/thinking activities, and others. After two years of tutoring, the individual had a listening comprehension level at the college level and could read a variety of texts ranging from fourth- to seventh-grade difficulty. His writing evidenced continuing difficulties in spelling, writing conventions, and syntax.

Four experimental studies have examined teaching or learning supports for adults with CP. McNaughton and Tawney (1993) employed an alternating treatment, single-subject design to investigate the effects of two study strategies, copy-write-compare and student-directed-cueing (SDC), on the spelling accuracy of two adults. Both strategies were found to improve the subjects' spelling, but the SDC technique resulted in greater retention over time. One noteworthy aspect of the study is how time-consuming (12-20 hours distributed across 3-5 week) both strategies were for learning just 24 personally relevant words.

Koke and Neilson (1987) employed a single-subject design to evaluate the efficacy of word processing with synthesized speech feedback in improving spelling accuracy in context for three adolescents and young adults with CP, ages 16-22 years, who had severe speech impairments. Picture prompts were used to elicit written compositions with and without the presence of speech feedback. Subjects were more accurate and more likely to engage in editing with the feedback than without.

De Hoop (1965), while not interested in literacy development specifically, administered a listening comprehension test to 63 adolescents with CP, mean chronological age of 15 years. In one experimental condition subjects listened to a tape recorded story 2 1/3 times in six minutes. Pretest-posttest improvement was 5.6 items on a 20-item, multiple-choice comprehension assessment with a range of -2 to +16 items. In essence, the study suggests that given opportunity to listen to text read aloud, adolescents with CP can improve their listening comprehension.

Gandell (1991) developed an intervention with potentially widespread applications. Two adults, ages 23 and 25 years, with CP used a symbol-based (Blissymbols) telecommunications software to produce text in traditional orthography in order to carry on telephone conversations for 9 hours per week over 10 months. Both subjects evidenced increased word identification and reading comprehension scores as well as increasingly interactive use of the telecommunications system. The model is exciting in its potential for addressing the literacy difficulties of individuals with developmental disabilities through distance education alternatives to classroom-based instruction.

One study has examined the contexts that may support literacy learning in adults with CP. In a retrospective survey, Koppenhaver, Evans, and Yoder (1991) asked 22 literate adults with severe speech and physical impairments from across the United States and Canada to recall childhood literacy experiences at home and in school. Informants described school and home environments rich in reading materials, models of literate behavior, and opportunities to read and interact with others. Writing experiences were far more restricted, particularly in the home. Respondents attributed their learning

success to parental support and expectations as well as their own persistence and talents.

CONCLUSIONS

While the number of studies is small in literacy and adults with CP, it is apparent that there is a wider distribution of focus than is true of research in either autism or mental retardation. Studies to date have examined word and subword performance as well as sentence-level and text-level performance. Both highly literate and low-skilled individuals have served as subjects. Instructional strategies have been designed and studied experimentally. Several studies have been conducted to profile the literacy performance of individuals with CP on a variety of tasks. Initial studies have even been reported on the design of a literacy program and the home and school contexts that may support literacy learning in individuals with CP.

It is premature to draw conclusions from such a small body of research, but we believe that at least some preliminary ideas are beginning to surface. Essentially the research to date suggests the presence of widespread and severe literacy learning difficulties in this population. At the same time, it suggests that individuals with CP are capable of learning to read and write conventionally and some have done so in supportive program environments using many of the same strategies and under similar conditions as those that have proven successful with nondisabled individuals. As we must conclude in reviewing both the autism and mental retardation literature as well as this work in cerebral palsy, there is a critical need for additional research that will enable clearer documentation of the true extent and nature of the difficulties and a better understanding of how to address those difficulties systematically.

REFLECTIONS AND PROJECTIONS ON LITERACY RESEARCH AND ADULTS WITH DEVELOPMENTAL DISABILITIES: TOWARD A RESEARCH AGENDA

When we reflect on the research to date on literacy learning in persons with developmental disabilities, we are at once struck but how little has been accomplished and how much remains to be explored. We hope that careful consideration of the information presented in this report will allow current and future researchers to carefully consider research priorities rather than perform an empirical form of pin-the-tail-on-the-donkey. While research is clearly needed in all areas of literacy learning from the perspectives of multiple disciplines, we believe that some guidance is available within this report and in the lessons learned from other fields of literacy study. To that

end, we offer our reading of the research reviewed here and suggestions for developing a research agenda.

A logical starting place seems to us to be answering the question, "What do we know about literacy learning and instruction in adults with developmental disabilities?" In a word, nothing. From the autism literature, we have the barest hint that adults and adolescents can improve their ability to read words in isolation and to write better texts when provided instruction and practice and that a controversial technique known as facilitated communication may enable some individuals with autism to demonstrate otherwise hidden literacy competencies. From the research on adults with mental retardation, we can begin to argue that these adults and adolescents can be taught to read and spell single words individually or in groups through a variety of instructional techniques, can improve their oral reading if provided feedback of various types, and may be able to read or write texts with difficulty. The cerebral palsy literature documents the presence of reading and writing difficulties in the samples selected to date and suggests that adults and adolescents with severe speech impairments can distinguish sounds in words (i.e., possess a critical underlying skill necessary to conventional literacy learning) and that a few adults have improved targeted word and text-level skills given the opportunity or instruction.

Perhaps a more useful starting place might be to answer the question, "What lessons are to be learned from the research to date?" Here we find several potentially useful ideas for consideration, and we will focus on just four of particular importance. First, researchers should think carefully about research designs. Developmental disabilities are by nature widely variant across individuals. What does the mean "mean" in a group experimental design? Measures of average performance or significant differences based on group performance hide widely varying outcomes and provide little of the detail necessary to guide adult literacy practitioners as they cope with the needs of their very un-average adults who may have cerebral palsy, use an icon-based keyboard to produce orthographic text, access a computer with a head switch, and experience occasional seizures and cope with visual processing problems. Case studies, while always individual in nature, provide substantially greater detail from which practitioners can compare and contrast with the individuals with whom they work. If these case studies went a step further and were theoretically grounded, they would provide further guidance for instructional decision making.

Second, research has been severely hampered by the absolute absence of literacy assessments that have been validated for use with adults who have developmental disabilities. How are we to interpret experimental results when they arise from either performance on tasks validated for use with nondisabled adults, or from researcher-designed or adapted measures devoid of information related to validity and reliability of use with adults who have developmental disabilities? Before significant progress can be made in determining effective and efficient teaching and learning strategies, tools, and materials, a good deal of ground work will need to be completed in the development of valid, reliable, and instructionally useful assessment techniques and tools.

Third, in overviewing the existing body of research, we are struck by how little attention is directed toward best practices in literacy. While there are certainly heated arguments about how nondisabled adults should be taught to

read and write, there are few educators who would devote 60 hours of tutoring time to studying a small list of words in isolation. It seems almost at times that in a tunnel-visioned search for significant differences or experimental effects, we have at times left common sense or programmatic realities out of the picture. Few adult literacy programs, offering services a few hours a day, one or two days a week, could afford to focus exclusively on learning to read or spell arbitrarily selected single words, however functional they might be.

And that leads us to what we view as a final lesson; we believe it is imperative that researchers study not only individual performance given a variety of texts and tasks, but also the contexts that support literacy learning for adults with developmental disabilities. Adults with developmental disabilities will enter adult literacy programs in increasing numbers in the next few years, and those programs quite likely have never encountered any student quite like them before. Literacy providers will be unsure how to interact with persons who have severe communication difficulties, may be unable to talk, or who use sticks attached to their heads to point to letters and pictures of words and concepts that they want to convey. These providers are unlikely to know exactly how to structure instructional activities or evaluation forms and formats to facilitate the participation of someone who may be occasionally aggressive, or who relies on a wheelchair for mobility, or who is unable to speak or hold a pencil. They will have spent their childhood and adult life in a world that in many direct and indirect ways made it clear that the contributions of individuals with disabilities were neither expected nor valued. Researchers must begin to delineate how to structure communication, materials and classroom environments, and our own attitudes and expectations to facilitate participation in and learning from literacy events by adults with developmental disabilities. Otherwise, we will be left with a grab bag of experimentally effective tools and techniques and little, if any, idea of how to organize them consistently for programmatic success.

As we look ahead at the challenge presented to researchers and educators of adults with developmental disabilities, we recognize both an enormous task and an enormous reward. Fully and successfully including adults with developmental disabilities in adult literacy reforms will expand our perceptions of research, literacy, instruction, assessment, and human potential. The rewards will be economic as more adults with disabilities are more able to enter supported and competitive employment. They will be political as more adults with disabilities gain the skills necessary to obtain their legal, educational, and civil rights. They will be democratic as more adults with disabilities enter into fuller participation in all aspects of our society with the skills necessary to communicate their ideas. The legislation, the knowledge, and the tools have never before in history provided such a firm ground from which to begin. Now it remains for the research field to take up the challenge of providing the countless large and small details necessary to make such rewards a reality.

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